

## COLLAPSIBLE SIDERAIL ASSEMBLY

## FIELD OF THE INVENTION

[0001] This invention relates to a siderail assembly for a bed and, more particularly, to a siderail assembly that is configured to expand in the top to bottom dimension thereof as the siderail transitions from a stowed position to a fully deployed position.

## BACKGROUND OF THE INVENTION

[0002] Equipment for use in a patient care facility has been categorized in the past into constructions adapted for limited use. For example, hospital beds located within hospital rooms were ordinarily constructed so as to remain in the room and not be capable of easy transport to and from the room. As a result, it became necessary to transfer the patient from the hospital bed to a patient transport carrier for transporting the patient to a remote location for additional treatment, whereat the patient would likely need to be transferred to an additional supporting surface. It would be desirable to provide a patient supporting surface, namely, a hospital bed, that is usable both in the hospital room as well as usable for effecting transport of the patient from the room to a remote location for additional treatment, including surgery, while remaining supported on the patient supporting surface of, for example, the hospital bed.

[0003] In order to effect the safe transport of a patient on the patient supporting surface, it is necessary to provide a siderail mechanism on both lateral sides of the bed to prevent the patient from exiting the patient supporting surface either voluntarily or

involuntarily. Since the patient will be experiencing additional healthcare treatment while positioned on the patient supporting surface, it is required that the siderail be retractable and removable to a position free of interference of the healthcare personnel providing the additional treatment to the patient. Simply collapsing the siderail from its initial deployed position wherein the handrail thereon is above a plane of the patient supporting surface to a position below the plane of the patient supporting surface is simply not enough. The siderail configuration will interfere with the close access required for the healthcare personnel to access the patient supported on the patient supporting surface. Further, as the siderail is moved from the fully deployed position to the stowed position, it would be desirable to provide a siderail that would collapse in the top to bottom dimension thereof so that the distance traveled by the siderail from the deployed position to the stowed position can be minimized to prevent interference with structure on the base of the bed.

**[0004]** Therefore, it is an object of this invention to provide a siderail construction for a patient supporting surface that is elevatable to a deployed position preventing voluntary or involuntary exit of the patient from the patient supporting surface while simultaneously being movable to a position providing free and unobstructed access to the patient supported on the patient supporting surface.

**[0005]** It is a further object of the invention to provide a siderail construction, as aforesaid, wherein the siderail itself is retractable to a position beneath the patient supporting surface enabling the healthcare

attendant to move close to the lateral edge of the patient supporting surface for convenient access to the patient supported on the patient supporting surface.

[0006] It is a further object of the invention to provide a siderail construction, as aforesaid, wherein the top to bottom dimension of the siderail is variable as the siderail moves from the deployed position toward the stowed position and to thereby limit the overall vertical distance traveled by the siderail as it moves in the aforesaid direction.

[0007] It is a further object of the invention to provide a siderail construction, as aforesaid, wherein the operation of the siderail between its stowed position and its fully upright deployed position can be accomplished by the healthcare attendant through the use of only one hand.

[0008] It is a further object of the invention to provide a siderail construction, as aforesaid, which is of a durable construction and requires little or no maintenance.

[0009] It is a further object of the invention to provide a siderail construction, as aforesaid, which is easy to clean.

#### SUMMARY OF THE INVENTION

[0010] The objects and purposes of the invention are met by providing a siderail assembly for a bed which includes a frame having thereon at least one pivotally supported arm for movement between first and second positions, the arm having at a distal end thereof a first connection location. A siderail support frame is pivotally connected to the distal end of the arm and has thereon at least one upstanding and elongate guide

member. A siderail carriage frame is supported for movement along a length of the guide member toward and away from the siderail support frame and has thereon at least one second connection location. An elongate link is pivotally connected to and extends between the first and second connection locations to effect movement of the siderail carriage frame along the guide member toward and away from the siderail support frame in response to a pivotal movement of the arm relative to the frame to change the spacing between the siderail carriage frame and the siderail support frame.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Other objects and purposes of this invention will be apparent to persons acquainted with siderail apparatus of this general type upon reading the following specification and inspecting the accompanying drawings, in which:

[0012] Figure 1 is a top, rear and right side isometric view of a siderail assembly embodying the invention;

[0013] Figure 2 is a rear view of the siderail assembly illustrated in Figure 1;

[0014] Figure 3 is a right side elevational view of the assembly illustrated in Figure 1;

[0015] Figure 4 is a right side view similar to Figure 3, but with the siderail assembly shifted to the right;

[0016] Figure 5 is a right side view of the siderail assembly similar to Figure 4, but with the siderail shroud on the siderail removed;

[0017] Figure 6 is a front view of the siderail assembly with the siderail shroud removed;

[0018] Figure 7 is a top, rear and right side isometric view corresponding to Figure 1;

[0019] Figure 8 is a top view of Figure 7;

[0020] Figure 9 is a top, rear and right side isometric view of the siderail assembly in a shifted position midway between the stowed position of Figure 1 and a fully deployed position;

[0021] Figure 10 is a rear view of Figure 9;

[0022] Figure 11 is a top, rear and right side isometric view of the siderail assembly corresponding to Figure 9 and with the siderail shroud removed;

[0023] Figure 12 is a front view of Figure 11;

[0024] Figure 13 is a top view of Figure 11;

[0025] Figure 14 is a right side view of Figure 11;

[0026] Figure 15 is a top, rear and right side isometric view of the inventive siderail assembly in a further position thereof between the fully stowed position and the fully deployed position;

[0027] Figure 16 is a rear view of Figure 15;

[0028] Figure 17 is a top, rear and right side isometric view of the siderail assembly in a fully deployed position;

[0029] Figure 18 is a front view of Figure 17;

[0030] Figure 19 is a right side view of Figure 17;

[0031] Figure 20 is a top, front and right side isometric view of the configuration illustrated in Figure 18;

[0032] Figure 21 is a front view of Figure 20; and

[0033] Figure 22 is a left side view of Figure 21.

#### DETAILED DESCRIPTION

[0034] Certain terminology will be used in the following description for convenience in reference only

and will not be limiting. The words "up", "down", "right" and "left" will designate directions in the drawings to which reference is made. The words "in" and "out" will refer to directions toward and away from, respectively, the geometric center of the device and designated parts thereof. Such terminology will include derivatives and words of similar import.

[0035] The invention disclosed herein will be usable on a variety of patient support apparatuses, namely, beds. Thus, a specific bed is not illustrated. However, one typical type of patient support apparatus and a siderail configuration therefor is disclosed in U.S. Patent No. 6 360 385 presently commonly owned by the Assignee of record for this invention. The subject matter of U.S. Patent No. 6 360 385 is to be incorporated herein by reference.

[0036] Figure 1 illustrates a siderail assembly 10 embodying the invention. The siderail assembly 10 includes a plate 11 configured to be mounted to the understructure supporting the patient support deck on a conventional patient support apparatus. The location of the plate 11 is preferably along the lateral edges of the understructure for the patient support deck associated with the head section and the seat section for the bed. At least one elongate and laterally extending track 12 (Figures 3 and 4) is secured to the underside of the plate 11 by a plurality of fasteners 13. A carriage 14 is supported for lengthwise movement on the track 12 between the positions illustrated in Figures 3, 4 and 5. If desired, plural longitudinally spaced tracks 12 can be secured to the underside of the plate 11 as is illustrated in Figure 2. Each of the tracks 12 extends

parallel to one another and are designed to terminate approximately flush with a vertical plane containing the lateral edge of the patient support deck. Further, and in this particular embodiment, the carriage 14 is guided by and extends between each of the plural tracks 12. The carriage 14 supports at least one journal 16 housing a bearing assembly (not illustrated) for pivotally supporting at least one elongate arm 17. In this particular embodiment, however, two such journals 16 are provided so that a pair of arms 17 are pivotally supported by respective ones thereof.

**[0037]** A siderail support frame 20 (Figures 5-8) includes a base 21 on which is provided at least one journal 22 extending from the rear side thereof as illustrated in Figure 5 and incorporates therein structure facilitating a pivotal connection to the distal end of the arm 17. As stated above, and as disclosed herein, a pair of arms 17 are provided and, therefore, the base 21 includes a pair of journals 22 as illustrated in Figures 7 and 8 to facilitate a pivotal connection of the distal ends of each of the arms 17 to the base 21. This connection enables the arms 17 to always remain parallel to one another in all pivoted positions thereof as will become readily apparent below. An axle 23 rotatably supported in the bearings housed within the journals 22 is fixedly secured to the respective arms 17. The end of the axle remote from the arm 17 includes a flat surface 24, the flat surfaces being oriented in parallel planes in all positions of the arms 17. The purpose of the flat surfaces 24 will be explained in more detail below.

[0038] A pair of parallel extending guide members 26 are fixedly mounted to the siderail support frame 20 and extend upwardly therefrom as illustrated in Figure 6. In this particular embodiment, the guide members 26 extend parallel to one another and are inclined to the vertical. A carriage 27 is supported for reciprocal movement along the length of the guide members 26.

[0039] As is illustrated in Figure 7, the axle 23 also includes a lever arm 25 fixedly secured thereto and is movable therewith. The purpose of the lever arm 25 will be explained in more detail below.

[0040] A link member 28 is pivotally connected to the lever arm 25 as at 29 and to the carriage 27 as at 31. In this particular embodiment, the link member 28 is composed of a pair of parallel extending linkages 32 and 33 that are configured to straddle the lever arm 25 and straddle a flange 34 provided on the carriage 27. A shroud 36 is configured to cover the base frame 21 as illustrated in Figures 1 and 2. Similarly, a further shroud 37 is configured to attach to the carriage 27. An initial spacing  $X_0$  exists between the two shrouds 36 and 37 as illustrated in Figure 2 and the initial overall top to bottom dimension of the two shrouds 36 and 37 is indicated as  $Y_0$  in Figure 2. The dimensions  $X_0$  and  $Y_0$  are to be noted as being associated with the siderail assembly being in the lowered position wherein the upper edge 38 of the shroud 37 is positioned beneath the plate 11 to facilitate stowage of the siderail assembly beneath the substructure supporting the patient support deck.

[0041] Referring to Figure 22, the base 21 of the siderail support frame 20 includes an elongate plate 40 hingedly secured at opposite ends thereof and as at 41 to



the base 21. The plate 40 overlays a front face of the base 21 with a lower edge 42 being capable of moving into and out of interfering relation with the flat surface 24 on each axle 23. When the plate 40 is pivoted to the angle  $\beta$  (Figure 22) relative to the vertical about the axis of the pivot connection 41, the edge 42 of the plate will be spaced from the flat surfaces 24 to thereby allow the axles 23 to freely rotate. Since the axles 23 are fixedly secured to each of the arms 17, engagement of the edge 42 with the flat surfaces will prevent any pivoting movement of the arms 17 with respect to the carriage 14 and the base 21. Manipulation of the plate 40 will be facilitated by the connection of a handle 43 to the plate 40.

#### OPERATION

[0042] Although the operation of the siderail assembly 10 described above will be understood from the foregoing description by skilled persons, a summary of such description is now given for convenience.

[0043] For convenience, the following is a brief overview of the content of the drawings. Figures 1-8 illustrate the siderail assembly in its lowermost position to facilitate lateral movement of the carriage 12 along the tracks 12 and to facilitate stowage of the assembly beneath the substructure for the patient support deck. Figures 9-14 illustrate the siderail assembly positioned alongside of a lateral edge of the patient support deck with the arms 17 having been rotated 90° from the position illustrated in Figures 1-8. Figures 15-16 illustrate the arms 17 having been pivoted beyond the 90° position to an approximate 135° position compared to the position of the arms in Figures 1 to 8. Figures 17-22

illustrate the arms 17 in their final fully deployed positions spaced  $180^\circ$  from the position illustrated in Figures 1-8.

[0044] During the aforesaid pivoting motion of the arms 17, it is assumed that the plate 40 has been lifted and pivoted to the position illustrated in Figure 22 so that the downwardly facing edge 42 is spaced from an interfering relation with the flat surfaces 24 on the axles 23. Since the axles 23 are fixed to the arms 17, the lifting force applied by one hand of the attendant to the handle 43 (Figure 21) will cause the lever arms 25 (Figure 7) to effectively travel with the axles as the arms pivot to effect a raising of the link members 28 in the vertical direction to in turn cause the carriages 27 to move upwardly relative to the guide members 26. It will be noted in Figure 10, when comparing same to Figure 2, that the spacing between the two shrouds 36 and 37 has increased to the dimension  $X_1$  whereas the overall top to bottom dimension of the two shrouds 36 and 37 has increased to the dimension  $Y_1$ . The dimensions  $X_1$  and  $Y_1$  correspond to the arms 17 being in the  $90^\circ$  position as illustrated in Figures 10-14. A continued movement of the lever arms 17 to the  $135^\circ$  position illustrated in Figures 15 and 16 will orient the lever arm 25 to a vertically upright extending position representing the highest position of the carriage 27 and thence the shroud 37 secured thereto. This is due to the lever arms 25 extending vertically in this position as shown in Figure 16. The dimension  $X_2$  has increased beyond the previously mentioned dimension  $X_1$  and the top to bottom dimension of the two shrouds 36 and 37 has increased to the dimension  $Y_2$  which is greater than the previous

dimension of  $Y_1$ .  $X_2$  and  $Y_2$  are the largest dimensions herein described.

**[0045]** Continued movement of the arms 17 to the  $180^\circ$  position illustrated in Figures 17-22 will cause the lever arms 25 to move counterclockwise from the position illustrated in Figure 16 to an approximate  $45^\circ$  orientation relative to the vertical so as to reduce the dimension between the two shrouds 36 and 37 a small amount as well as reducing the top to bottom dimension of the two shrouds 36 and 37 also by a small amount. If desired, the lever arms 25 could be restructured so as to be essentially an elongate extension of the lever arm 17 so that when the lever arms 17 are in the vertically upright position illustrated in Figures 17-22, the lever arms 25 will extend upwardly therefrom thereby causing the dimension between the two shrouds to increase beyond the  $X_2$  dimension previously described and the overall top to bottom dimension of the shrouds 36 and 37 to also increase beyond the aforementioned dimension  $Y_2$ . However, it has been discovered that an orienting of a longitudinal axis of the lever arms 25 at about a  $35^\circ$  to  $55^\circ$  angle, preferably at a  $45^\circ$  angle, relative to the longitudinal axis of the respective arm 17 provides the appropriate leverage to facilitate the aforesaid movements.

**[0046]** Although a particular preferred embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.